

November 3, 2003

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SUBJECT: PROPOSED INTERIM STAFF GUIDANCE (ISG)-12: ADDITION OF GENERIC AGING LESSONS LEARNED (GALL) AGING MANAGEMENT PROGRAM (AMP) XI.M35, "ONE-TIME INSPECTION OF SMALL-BORE PIPING," FOR LICENSE RENEWAL

Dear Messrs. Marion and Lochbaum:

The purpose of this letter is to provide you with an opportunity to comment on proposed interim staff guidance (ISG) that adds GALL AMP XI.M35, "One-Time Inspection of Small-Bore Piping," for license renewal. Operating experience has shown that cracking of small-bore Class 1 piping as a result of stress corrosion or thermal fatigue has not been prevalent during service. Thus, for plants that have not experienced cracking of small-bore Class 1 piping resulting from stress corrosion or thermal fatigue, a one-time inspection is an acceptable method for confirming that these aging effects are not occurring. However, if a plant has experienced cracking in small-bore Class 1 piping as a result of stress corrosion or thermal fatigue, periodic inspection may be necessary as a plant-specific AMP. The U.S. Nuclear Regulatory Commission (NRC) staff has developed the proposed ISG to clarify under what circumstances a one-time inspection is needed for small-bore Class 1 piping to provide additional assurance that the small-bore piping is not aging or that the effects of aging are insignificant.

In the April 18, 2001, License Renewal Steering Committee meeting, the Nuclear Energy Institute (NEI) identified small-bore Class 1 piping as one of five topics in the GALL report needing continued dialog with the staff (see ADAMS Accession No. ML011410321). On May 29, 2002, the staff met with NEI and other industry representatives to discuss the status of industry activities on those five topics. At this meeting, NEI indicated that the GALL report should be revised to reflect the staff's acceptance of one-time inspection of small-bore Class 1 piping in license renewal applications. Also, during the meeting, it was agreed that an ISG should be issued to clarify under what circumstances a one-time inspection is needed for small-bore Class 1 piping (see ADAMS Accession No. ML021630359).

The staff is enclosing its rationale for a new ISG-12 (Enclosure 1), and proposed GALL AMP XI.35, "One-Time Inspection of Small-Bore Piping" (Enclosure 2). The NRC is requesting your comments on the proposed ISG within 30 days following the date of this letter to facilitate a timely resolution of this issue.

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A. Marion and D. Lochbaum

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For resolved ISGs, it is also possible that comparable changes might be needed for future revisions to NEI 95-10, "Industry Guidance for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule." If you have any questions regarding this matter, please contact Mr. Peter Kang of my staff at 301-415-2779.

Sincerely,

*/RA/*

Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Project 690

Enclosures: As stated

cc w/encls: See next page

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\* See Previous Concurrence

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Accession No. ML033100516

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PROPOSED INTERIM STAFF GUIDANCE (ISG)-12: ADDITION OF  
GENERIC AGING LESSONS LEARNED (GALL)  
AGING MANAGEMENT PROGRAM (AMP)  
XI.M35, "ONE-TIME INSPECTION OF SMALL-BORE PIPING,"  
FOR LICENSE RENEWAL

Staff Position

Small-bore piping is ASME Class 1 piping less than 4-inches nominal pipe size (NPS), which includes pipes, fittings, and branch connections. This small-bore piping does not receive volumetric examination during service. Operating experience has shown that cracking of small bore piping as a result of stress corrosion or thermal fatigue has not been prevalent during service. Thus, for plants that have not experienced cracking of small-bore Class 1 piping resulting from stress corrosion or thermal fatigue, a one-time inspection is an acceptable method for confirming these aging effects are not occurring. However, if a plant has experienced cracking in small-bore Class 1 piping resulting from stress corrosion or thermal fatigue, periodic inspection may be necessary as a plant-specific AMP. Therefore, applicants for license renewal should evaluate these pipes for susceptibility to cracking from these aging mechanisms and determine whether a one-time volumetric inspection of such pipes is needed or it should propose a plant-specific AMP for them. The staff intends to revise the GALL report to clarify that for plants that have not experienced such cracking, a one-time inspection is needed to provide additional assurance that aging of such piping is not occurring or that the effects of aging are insignificant.

Rationale

The current ASME Section XI inspection requirements, according to Table IWB-2500-1, Examination Category B-J, Item No. B9.21, for small-bore piping include a surface examination for piping less than 4-inches NPS and greater than 1-inch NPS. Also, Examination Category B-P requires system leakage and hydrostatic tests for small-bore piping. A volumetric examination is used to detect cracking resulting from high cycle thermal fatigue or stress corrosion. For plants that have not experienced cracking of small-bore Class 1 piping resulting from stress corrosion or thermal fatigue, an AMP would not be warranted at the time an applicant seeks to renew its license. However, a one-time inspection can provide additional assurance that either aging of Class 1 piping is not occurring or the effects of aging are insignificant. The method chosen for the one-time inspection of small-bore piping should be volumetric examination. The program description should include volumetric examination of inspection locations selected on the basis of detailed evaluations of material susceptibility, operating environment, stress, and risk. A risk-informed method can be used to determine locations susceptible to crack initiation resulting from stress corrosion or thermal cycling due to thermal stratification or turbulent penetration. The sample size should be based on an assessment of materials of fabrication, environment, aging effects, and operating experience.

## XI.M35 One-Time Inspection of Small-Bore Piping

### Program Description

Small-bore piping is ASME Class 1 piping less than 4-inches normal pipe sizing, which includes pipes, fittings, and branch connections. The current ASME Section XI inspection requirements, according to table IWB-2500-1 Examination Category B-J Item No. B9.21, for small-bore piping include a surface examination for piping less than 4 inches and greater than 1-inch. Also, Examination Category B-P requires to perform system leakage and hydrostatic tests. However, the staff believes that for a one-time inspection detection of cracking resulted from high cycle thermal fatigue or intergranular stress corrosion should be performed using volumetric examination. This is to provide additional assurance that either aging to Class 1 piping is not occurring or the aging is insignificant such that an aging management program (AMP) is not warranted. Should evidence of significant aging be revealed by a one-time inspection, periodic inspection may be necessary as a plant-specific AMP. The plant-specific program should also describe volumetric examination of inspection locations selected on the basis of detailed evaluations of material susceptibility, operating environment, stress, and risk.

### Evaluation and Technical Basis

- 1. *Scope of Program:*** The small bore piping inspection is a one-time inspection of a sample of ASME Class 1 piping less than 4-inches in diameter. The program includes measures to verify that degradation is not occurring, thereby confirming that there is no need to manage aging-related degradation or validating the effectiveness of any existing AMP for the period of extended operation. The sample size should be based on an assessment of materials of fabrication, environment, aging effects, and operating experience.
- 2. *Preventive Actions:*** One time inspection is an inspection activity independent of methods to mitigate or prevent degradation.
- 3. *Parameters Monitored/Inspected:*** Inspection is performed in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Code and 10 CFR Part 50, Appendix B, by using one or more of a variety of nondestructive examination (NDE) methods, including visual, volumetric, and surface techniques. A risk-informed analysis can be used to determine locations susceptible to crack initiation resulting from stress corrosion or thermal cycling due to thermal stratification or turbulent penetration.

4. **Detection of Aging Effects:** For small-bore piping, actual inspection locations are based on physical accessibility, exposure level, NDE techniques, and locations identified in U.S. Nuclear Regulatory Commission (NRC) Information Notice (IN) 97-46. The one-time inspection program for small-bore piping includes locations that are susceptible to crack initiation resulting from stress corrosion or thermal cycling due to thermal stratification or turbulent penetration. Guidelines for identifying piping susceptible to potential effects of thermal stratification or turbulent penetration are provided in EPRI report 1000701, "Interim Thermal Fatigue Management Guideline (MRP-24)," January 2001. For small-bore piping, one-time inspections using volumetric examination are performed on selected weld locations to detect cracking before the end of the current operating license.
5. **Monitoring and Trending:** This is a one-time inspection and, as such, no monitoring or trending is anticipated. This is considered appropriate because cracking of small-bore piping has not been prevalent in the industry and a one-time inspection program is adequate. However, the evaluation of the inspection results may indicate the need for additional examinations (i.e., a plant-specific AMP) consistent with ASME Section XI, Subsection IWB.
6. **Acceptance Criteria:** If flaws or indications exceed the acceptance standards of ASME Paragraph IWB-3400, they are evaluated in accordance with IWB-3131, and additional examinations are performed in accordance with IWB-2430.
7. **Corrective Actions:** The site corrective action program, quality assurance (QA) procedures, site review and approval process, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable in addressing the corrective actions, confirmation process, and administrative controls.
8. **Confirmation Process:** See Item 7, above.
9. **Administrative Controls:** See Item 7 above.
10. **Operating Experience:** This one-time inspection is a new activity, which will use volumetric techniques with demonstrated capability and a proven industry record to detect piping weld and base material flaws. However, the specific application of the technique on small-bore piping needs to be qualified before the examination.

## References

10 CFR 50.55a, *Codes and Standards*, Office of the Federal Register, National Archives and Records Administration, 2000

ASME Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, ASME Boiler and Pressure Vessel Code, 1995 edition through the 1996 addenda, American Society of Mechanical Engineers, New York, NY.

NRC Information Notice 97-46, *Unisolable Crack in High-Pressure Injection Piping*, U.S. Nuclear Regulatory Commission, July 9, 1997.

EPRI report 1000701, *Interim Thermal Fatigue Management Guideline (MRP-24)*, January 2001 (ADAMS Accession No. ML010810162).

NUCLEAR ENERGY INSTITUTE

Project No. 690

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